Claims

[c1] A method for correcting spherical aberration in an electron beam having an upstream region and a downstream region, said method comprising:

producing an electron beam;

removing ions from the electron beam using electrical fields in the upstream region of the electron beam;

allowing ions to accumulate in the downstream region of the electron beam using an ion trap and a grounded tube; and

adjusting a range of spherical aberration correction of the ion trap with the grounded tube.

[c2] The method of claim 1, further comprising adjusting an aperture in the ion trap to adjust the range of spherical aberration correction of the ion trap.

[c3] The method of claim 1, further comprising applying a voltage to the ion trap to form a neutralization boundary to trap the ions accumulated in the downstream region of the electron beam.

[c4] The method of claim 3, wherein the voltage applied to the ion trap to form the neutralization boundary decreases as a radius of the grounded tube decreases.

[c5] The method of claim 1, wherein the ion trap comprises a positive ion electrode.

[c6] The method of claim 1, wherein the electrical fields are generated by an ion clearing electrode.

[c7] A computed tomography system, said system comprising:

an electron beam source for generating an electron beam;

an ion clearing electrode for removing ions from said electron beam using electrical fields;

an ion trap for allowing ions to accumulate in a downstream region of said electron beam so that said ions do not drift upstream;

a beam tube for housing said ion trap; and

a grounded tube, located downstream of said ion trap, said grounded tube being electrically grounded, an effective electrical radius of said beam tube conforming to a physical radius of said grounded tube to

reduce spherical aberration in said electron beam.

[c8] The system of claim 7, wherein said grounded tube comprises a non-magnetic grounded tube.

[c9] The system of claim 7, wherein a radius of said grounded tube extends a lower limit of spherical aberration correction of said ion trap.

[c10] The system of claim 7, wherein said ion trap comprises a positive ion electrode, said positive ion electrode including an aperture through which said electron beam passes.

[c11] The system of claim 10, wherein size of said aperture is adjusted to adjust an upper limit of spherical aberration correction of said ion trap.

[c12] The system of claim 7, wherein said ion trap uses a voltage to create a neutralization boundary to trap ions in said downstream region of said electron beam.

[c13] The system of claim 12, wherein said grounded tube decreases said voltage applied to said ion trap for a certain spherical aberration correction.

[c14] The system of claim 7, further comprising beam optics to at least one of aim and focus said electron beam.

[c15] The system of claim 7, further comprising a target producing x-ray radiation in response to impact by said electron beam.

[c16] The system of claim 15, further comprising a detector for detecting said x-ray radiation produced at said target.

[c17] A method for reducing spherical aberration in a computed tomography scanner, said method comprising:

increasing an upper limit of spherical aberration correction by widening an aperture of an ion trap, the ion trap allowing ions to accumulate in an electron beam at a downstream portion of the electron beam using an applied potential;

extending a lower limit of spherical aberration correction by positioning a

grounded tube beyond the ion trap; and

passing an electron beam through the ion trap and the grounded tube.

[c18] The method of claim 17, wherein the grounded tube decreases the applied potential for spherical aberration correction.

[c19] A system for correcting spherical aberration in an electron beam, said system comprising:

an ion trap having a voltage for applying a potential to an electron beam to allow ions to accumulate in said electron beam in a portion of said electron beam downstream from said ion trap in order to reduce spherical aberration in said electron beam; and

a grounded tube for extending a range of spherical aberration reduction in relation to at least one of dimension and position of said grounded tube, said grounded tube reducing said voltage applied to said ion trap.

[c20] The system of claim 19, wherein said voltage applied to said ion trap decreases as a radius of said grounded tube decreases.

[c21] The system of claim 19, wherein said range of spherical aberration reduction expands as size of an opening in said ion trap expands.